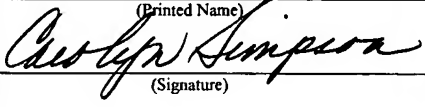




Atty. Dkt. No. 023829-0131

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Turner et al.
Title: PROCESS FOR OIL
EXTRACTION
Appl. No.: 10/036,331
Filing Date: 12/31/2001
Examiner: Tam M. Nguyen
Art Unit: 1764

CERTIFICATE OF EXPRESS MAILING I hereby certify that this correspondence is being deposited with the United States Postal Service's "Express Mail Post Office To Addressee" service under 37 C.F.R. § 1.10 on the date indicated below and is addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.	
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Carolyn Simpson (Printed Name)	
 (Signature)	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
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DECLARATION UNDER 37 CFR § 1.132

I, Matthew Turner, state and declare that:

1. I am an inventor of at least some of the subject matter claimed in U.S. Patent Application Serial No. 10/036,331.
2. I obtained Master of Science in Chemical Engineering from the University of Tennessee in 1992; a Master of Science in Systems Engineering Management from Murray State University in 1988; a Bachelor of Science in Chemical Engineering from the University of Tennessee in 1992; and a Bachelor of Science in Chemistry from Austin Peay State University in 1985.
3. I have been an employee of Cargill, Inc. since 1994. Cargill is a leading processor of vegetable oil seeds and vegetable oils. I am currently employed as Global Operations Manager for Cargill's Industrial Oils & Lubricants Business Unit.

4. Prior to my employment at Cargill, I was Assistant Professor of Chemistry at the United States Military Academy (West Point), from 1992 until 1994.

5. I am a contributing author to a chemistry textbook, Modern Applications of Chemistry, Kendall Hunt Publishing Company, 1993.

6. I believe that based on my education and experience, I am skilled in the art of processes for oil extraction from seed materials using solvents and the solvents themselves, and that, therefore, I am able to review and assess the subject matter of patents and patent applications as one of ordinary skill that relate to these fields. In this declaration, when I refer to a skilled artisan, I am referring to a person with the same skill set as described in this paragraph.

7. I have reviewed the Office Action for U.S. Patent Application Serial No. 10/036,331 dated February 23, 2005 ("Office Action"). I have also reviewed the relevant portions of U.S. Patent No. 2,596,010 to Crawford et al. ("Crawford"). I have also reviewed U.S. Patent Application Serial No. 10/036,331, and the claims in that application that have been amended in response to the Office Action.

8. It is my opinion, as a skilled artisan in the above-mentioned art, of which the Crawford patent relates, that: (1) Crawford fails to appreciate that small changes in the amounts and combinations of methylpentane, n-hexane, dimethylbutane, and hydrocarbons having less than 6 carbon atoms in a solvent mixture drastically effects the wet dew point (or wet bubble point) of the solvent; and (2) others skilled in the art, after reading Crawford, would not appreciate that small changes in the amounts of various solvent components, and the specific blends of solvent components identified in the claims of U.S. Patent Application Serial No. 10/036,331, as amended in response to the Office Action, would have a significant effect on the cooling capacity required to condense the vaporized solvent.

9. As shown in Table 1 below, comparing five different solvents, small changes in solvent composition has a significant effect on (1) the wet bubble and dew point temperatures of

the solvent at 375 mm Hg, and (2) the cooling area required to condense the solvents at 375 mm Hg, as calculated for a typical plant running 3000 tons per day of oil-containing solids (e.g., corn germ) using 170,000 pounds per hour of solvent and using 7000 gallons per minute of 95°F cooling water to condense the vaporized hydrocarbon solvent.¹

TABLE 1

Physical Characteristics	Solvent 1	Solvent 2	Solvent 3	Solvent 4	Solvent 5
n-pentane	0.16	-	-	-	0.03
2,2-dimethyl butane	7.37	5	2	1	0.01
2,3-dimethyl butane	13.97	10	3	2	0.41
2-methyl pentane	50.68	50	50	40	5.14
3-methyl pentane	27.77	35	45	57	12.45
n-hexane	0.05	-	-	-	68.45
Methyl-Cyclopentane	-	-	-	-	13.39
Cyclohexane	-	-	-	-	0.1
Wet bubble point (°F)	96.08	97.11	98.43	99.2	108.63
Wet dew point (°F)	103.06	104.01	105.25	106.04	117.22
Cooling Area at 95°F (Sq. Ft.)	51315	41154	30061	25876	9685
Percentage of Cooling Area Required As Compared to Solvent 5	530%	425%	310%	267%	100%

¹ Calculations were performed with Aspen Plus, v.10.2 software, assuming a heat transfer coefficient of 150 Btu/hr/ft²/°F. Moreover, 95°F was utilized as the temperature at which to evaluate the usefulness of a hydrocarbon solvent for oil extraction processes because the ambient cooling water temperature can reach between approximately 85°F and 95°F during summer months in many regions.

10. “Solvent 1” and “Solvent 5” are representative of solvents which have been used to extract oil from plant-derived materials prior to the inventions disclosed in U.S. Patent Application Serial No. 10/036,331. Companies in the oil-extraction industry are trying to move away from the use of solvents similar to Solvent 5 because of restrictions on the use of n-hexane. Solvent 1 is a commercially-available substitute for Solvent 5.

11. Solvents 2, 3, and 4 are the types of solvents that can be made in accordance with the teachings of U.S. Patent Application Serial No. 10/036,331, and to the best of my knowledge have not been used for commercial extraction of oil from plant-derived materials prior to the time that I invented the processes disclosed in U.S. Patent Application Serial No. 10/036,331, and being claimed in response to the Office Action.

12. As is shown in Table 1, Solvents 2, 3, and 4 provide significant improvements over Solvent 1, the commercially-available substitute for Solvent 5. For example, an oil extraction plant that changed its process to use commercially available isohexane (Solvent 1) in lieu of commercial n-hexane (Solvent 5) would require approximately **530%** of the cooling capacity to condense Solvent 1 as compared to Solvent 5. When the bubble point of the solvent nears the temperature of 95°F cooling water (a temperature not uncommon in oil extraction processes during some times of the year), very small changes in wet bubble point temperatures dramatically affects the amount of cooling surface area required to condense the vaporized hydrocarbon solvent. Thus, the oil extraction plant would require a substantially greater amount of cooling capacity to condense the same amount of Solvent 1 over Solvent 5 under the same conditions, or risk blow-off of the vaporized solvent into the atmosphere.

13. Conversely, an oil-extraction plant using solvent compositions contemplated by U.S. Patent Application Serial No. 10/036,331, including Solvents 2, 3 and 4 of Table 1, and the solvents as claimed in U.S. Patent Application Serial No. 10/036,331, as amended in response to

the Office Action, would require substantially less additional cooling capacity to condense the vaporized solvent and prevent release of the vaporized solvent into the atmosphere because:

- Solvent 2, which has only a **0.95°F change** in wet dew point temperature from Solvent 1, would require approximately **20% less** cooling capacity over Solvent 1;
- Solvent 3, which has only a **2.19°F change** in wet dew point temperature from Solvent 1, would require approximately **42% less** cooling capacity over Solvent 1, and
- Solvent 4, which has only a **2.98°F change** in wet dew point temperature from Solvent 1, would require approximately **50% less** cooling capacity over Solvent 1.

Thus, small changes in the composition of the solvents and wet bubble point temperature significantly affect the cooling capacity required to condense the solvents, which directly affects the costs associated with the oil-extraction process.

14. As shown, Solvents 2, 3, and 4, which are contemplated by U.S. Patent Application Serial No. 10/036,331, provide significant improvement over existing solvents that contain some amount of n-hexane (e.g., Solvent 1) due to the ratio of methylpentanes, dimethylbutanes, n-hexane, and hydrocarbons having less than 6 carbon atoms. Solvents 2, 3 and 4 also do not have the environmental problems commonly associated with solvents containing a large amount (>1.0%) of n-hexane (e.g., Solvent 5). Solvents 2, 3, and 4 also can be used more cost effectively than commercially available low n-hexane solvents (e.g., Solvent 1) because they require substantially less cooling capacity to condense the solvents to prevent blow-off into the environment.

15. A skilled artisan, after reading Crawford, would not appreciate that small changes in the amounts of solvent components, and the specific blends of solvent components, would have such a significant effect on the cooling area required to condense the vaporized solvent.

Although Crawford speaks generally of using a methylpentane blend, it fails to appreciate and disclose the impact of the other fractions of solvent used for oil extraction on the effect of the plant. Accordingly, Crawford fails to suggest teachings of U.S. Patent Application Serial No. 10/036,331, and the claims as amended in response to the Office Action.

16. Moreover, a skilled artisan after reading Crawford, would be **taught away** from using a solvent with a low amount of hydrocarbons having less than 6 carbon atoms and/or a low amount of 2,2-dimethylbutane. In particular, Crawford discloses that the use of isopentane (a C5 hydrocarbon) “can be employed with excellent results.” (Col 2, l. 50-Col. 3, l. 1). Crawford also discloses that using pure 2,2-dimethylbutane (neohexane), or alternatively, up to 40 wt.% 2,2-dimethylbutane (neohexane) “can be employed with excellent results.” (Col 2, l. 50-Col. 3, l. 1). As shown above, in Table 1, such low-boiling point fractions would have serious, deleterious effects by lowering the wet dew point temperatures which would (1) increase the required cooling capacity and, thereby, (2) increase the operational costs.

17. A skilled artisan, after reading Crawford, also would be **taught away** from using a small amount of n-hexane (<1.0%) in the solvent blend. In Crawford, the methylpentane blend utilized contained a substantial amount of n-hexane, at least 6.6%. (Table III). This amount of n-hexane, which would significantly raise the wet bubble point and dew point of the solvent, is an impermissible level of n-hexane for modern commercial applications that require less than 1.0% n-hexane.

18. The conclusions drawn herein are based on my knowledge as a person of ordinary skill in the art of processes for oil extraction from seed materials using solvents and the solvents themselves.

19. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are true, and further that these statements are made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that

such willful false statements may jeopardize the validity of the patent application or any patent issuing therefrom.

Date May 20, 2005

By Matthew Turner
Matthew Turner